RESEARCH PROGRAM ON Water, Land and Ecosystems

Led by IWMI International Water Management Institute

Taming Water Resource Variability through Innovative Storage Solutions

Photo: cc: Oxfam

A focus area within the CGIAR Research Program on Water, Land and Ecosystems

THE CHALLENGE

Fluctuations in water availability from both precipitation and river flows are a key contributor to low agricultural productivity and overall development. Extreme climate events such as floods and droughts, which are predicted to be increase in volume and intensity as a result of climate change, are key agents of crop destruction. The rural poor, who often still depend on rainfed agriculture, are also those who are the most affected by variable access to water supplies. Yet, water resource variability also has beneficial aspects: floods benefit fisheries and floodplain agriculture, and both droughts and floods may kill pests.

The challenge is, therefore, to reduce the negative impacts of water resource variability while simultaneously exploiting its benefits. Understanding how we can better manage water resources variability and adapt to extreme climate events can save billions of dollars and millions of lives.

OBJECTIVES

- To increase the reliability of water supplies for food production, livelihoods and ecosystems.
- To reduce the loss of lives, crops, livestock and infrastructure through alleviation of the negative impacts, or capitalizing of the positive consequences, of floods and droughts.

DID YOU KNOW

- Floodplains and wetlands are natural flow 'regulators' of water, in addition to multiple other functions. Their destruction has significantly increased the risk of flooding.
- In 2011, extreme climate events resulted in an estimated USD 200 billion of damage globally.
- Every dollar spent on pre-disaster water infrastructure can save up to USD 10 in disaster relief. Yet, 90% of aid is delivered after a flood or drought had occurred.

THE SOLUTIONS

In order to address the range of problems around water resources variability, the principal hypothesis is that by explicitly incorporating natural 'storage infrastructure' into water resource planning and management, the ecosystem services that this storage embeds can be used to improve water-based rural livelihoods, particularly agricultural production and reduce the adverse impacts from extreme events.

CGIAR Challenge Program on WATER & FOOD · CIAT · ICARDA · ICRISAT · World Agroforestry Centre · Bioversity International · Centro Internacional de la Papa CIP · IFPRI International Food Policy Research Institute · ILRI International Livestock Research Institute · IITA · WorldFish · FAO


Photo:cc: UNICEF

Image: Giriraj Amarnath/IWMI

The key question is - how can 'portfolios' comprising both natural and built storage infrastructure be designed, planned and managed in a way that maximizes the development benefits from water resources? Research focuses on (a) understanding and mapping the risks and hot spots for water resource variability management, i.e., areas most vulnerable to recurring extreme climate events; and those subject to largest inter- and intra-annual variability; (b) increasing the supply of water and associated benefits; and (c) reducing the damage caused by extreme events.

Along with providing information on water resource variability hot spots, we will test potential new solutions that combine natural (wetlands, aquifers) and man-made (ponds, reservoirs) infrastructure to safeguard the essential ecosystem services of water and land and maximize development benefits. We will also look at conjunctive management of floods and droughts as opposed to separating them. This includes capturing excessive floods in one wet year and 'depositing it' in the underground 'bank' (rather than in surface structures) – and aquifers – for use in subsequent drier years.

We will also explore how alternative smaller surface storage structures can be used instead of larger ones – promoting a continuum of water storage approaches. Further research will identify ways of managing existing or planned large dams for environmental and social outcomes through ensuring ecological releases and managing

We work in locations with extreme water resource variability, including South and Southeast Asia, with additional activities in West (Volta), East (Nile) and Southern (Limpopo/Zambezi) Africa, and Central Asia. Based on this research we will develop investment plans for improved management of large-scale water resources variability in selected Asian and African river basins.

CURRENT & POTENTIAL PARTNERS

Ministries of Water and Disaster Management, International Association of Hydrological Sciences (IAHS), Food and Agriculture Organization of the United Nations (FAO), Global Water System Project (GWSP), United Nations Environment Programme (UNEP), International Union for Conservation of Nature (IUCN) and international River Basin Organizations.

CONTACT

Vladimir Smakhtin (IWMI-WLE)
v.smakhtin@cgiar.org

Claudia Ringler (IFPRI-WLE)
c.ringler@cgiar.org

wle.cgiar.org/riverbasins